

## Science Olympiad Cobra Invitational – Wind Power Test Answers

1. d
2. cannot generate a secondary energy source on its own; must generate from primary source
3. c
4. c
5. 45231
6. e
7. false
8. true
9. false
10. false
11. true
12. false
13. HAWT
14. VAWT
15. VAWT
16. HAWT
17. c
18. b
19. 2 blade: lighter, cheaper, easier to install  
3 blade: more efficient given same wind conditions, more dynamically balanced
20.  $P = \frac{1}{2} \rho A v^3 = 9330.5 \text{ W}$
21.  $P = 0.593(9330.5) = 5532.0 \text{ W}$
22.  $P = IV = 120 \cdot 15 = 1800 \text{ W}$ ;  $C_p = 1800/9330.5 = 0.19$
23. Energy sources such as solar, wind, and hydropower are not consistently available to meet all demand and at the same time can be in oversupply. Storage helps balance supply with demand.
24. Mechanical: flywheel, gravitational pumped storage  
Chemical: battery, fuel cell  
Thermal: solar thermal collectors on rooftops
25.  $(100-62)/100 = 38/100 = 0.38$  or 38%
26.  $2/100 = 2\%$
27. There are 34 units of energy lost in the lightbulb itself. This is heat radiating from the bulb.
28. Choose another type of lightbulb besides incandescent, which does not radiate as much heat ex. LED or fluorescent